charcoal, such as the denser varieties of cellulose, yield it in relatively large quantities. It appears, therefore, to be produced by the action of sulphuric acid upon that portion of the wood charcoal which is least carbonised and retains a larger proportion of hydrogen and oxygen. Now it is well known that pyromellitic acid may be obtained by the action of sulphuric acid upon mellitic acid. M. Verneuil has recently shown, while these experiments of M. Girard were in progress, that when sulphuric acid acts upon wood charcoal a certain amount of mellitic acid is produced. It is therefore practically certain that by the action of sulphuric acid upon wood charcoal, in addition to the production of the gaseous dioxides of sulphur and carbon, mellitic acid is produced which in turn is converted by a further quantity of sulphuric acid into pyromellitic acid, and the latter is deposited in crystals in the cooler portion of the flask in which the reaction occurs.

THE additions to the Zoological Society's Gardens during the past week include two Brown Capuchins (*Cebus fatuellus*, ♂ ♂) from Guiana, presented respectively by Mr. Charles Gordon Frazer and Miss Florence Marryat; two Four-horned Antelopes (*Tetraceros quadricornis*, ♂ ♂), from India, presented by Mr. W. F. Sinclair; four common Swans (*Cygnus olor*), British, presented by Lord Braybrooke; two Jameson's Gulls (*Larus novæ-hollandiæ*), from Australia, presented by Sir Ferdinand von Mueller, K.C.M.G.; two Hoary Snakes (*Coronella cana*), a Crossed Snake (*Psammophis crucifer*), an Infernal Snake (*Boodon infernalis*), from South Africa, presented by Mr. J. E. Matcham; two Natterjack Toads (*Bufo calamita*), British, presented by Miss Peckham; three Stock Doves (*Columba œnas*), British, presented by Mr. Lionel A. Williams; a yellow-cheeked Amazon (*Chrysotis autumnalis*), from Honduras, two Alligator Terrapins (*Chelydra serpentina*), from North America, deposited; a White-bellied Sea Eagle (*Haliæetus leucogaster*), two Wonga-Wonga Pigeons (*Leucosarcia picata*), from Australia, purchased; a Reindeer (*Rangifer tarandus*, ♀), a Japanese Deer (*Cevous sika*, ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SUN-SPOTS AND WEATHER.—The first part of vol. vi. of "Indian Meteorological Memoirs" (Calcutta, 1894) contains a paper by Mr. W. L. Dallas, Assistant Meteorological Reporter to the Government of India, on the relation between sun-spots and weather, as shown by meteorological observations made on board ships in the Bay of Bengal during the years 1856 to 1879. The region selected offered peculiar advantages for such inquiry. The annual periodic changes in it are small, and the aperiodic changes are very slight. There is also comparatively little horizontal air motion, and, being a sea surface, the area is not liable to the sudden changes which affect a land observatory, and result from irregularities in the elevation of the land surrounding an observatory. The discussion of the pressure observations shows that there are certain points of similarity between barometer readings and the number of spots on the sun. The number of years during which the number of sun-spots exceeded the normal average coincides with the number of years during which the pressure was below the average, and *vice versâ*, while the maximum pressure differences, whether above or below the average, occur one year after the maximum sun-spot variations in both directions. The same general agreement is disclosed by the discussion of temperature observations, but here again there is the same want of exact relation. In the case of pressure the curves show that a defect of pressure prevailed during the years in which the relative number of spots was excessive; and an excess of pressure during the time they were at or about their minimum. So in temperature, it appears from Mr. Dallas' investigation, that there exists a general defect when the number of spots is low, and a general excess when the number of spots is high. The indications are, therefore, that years of maxima and minima in a solar cycle are also years of maximum and minimum solar radiation.

Another paper on sun-spots and weather has also recently been received (*Bulletin de la Société les Amis des Sciences et Arts de Rochechouart*, 1894), the author being Prof. J. P. O'Reilly. By extracts from the annals of Ireland (*Annala Proghacta Eireann*) and those of Ulster (*Annala Uladh*), it is shown that remarkable years of dryness and of cold in Ireland and in Europe are connected with the cycle of solar activity.

EPHEMERIS FOR TEMPEL'S COMET.—The following positions are extracted from the search ephemeris for Tempel's comet, given by M. Schulhof in *Astr. Nach.* No. 3219:—

Ephemeris for Paris Midnight.

1894.	R.A.	Decl.
	° ′ ″	° ′
June 2	1 0 16	S. 0 22·8
4	5 58	S. 0 3·9
6	11 37	N. 0 14·5
8	17 11	0 32·3
10	22 41	0 49·6
12	28 8	1 6·3
14	33 31	1 22·4
16	38 49	1 37·9

The comet is not in a good position for observation, but it may possibly be picked up in the east shortly before sunrise.

JUPITER'S SATELLITES IN 1664.—Under this head we reprinted, on February 1, a letter from the New York *Nation* upon a supposed observation of five satellites of Jupiter, made by John Winthrop in 1664. The note led Mr. Frank H. Clutz to determine whether there was any "fixt starre with which Jupiter might at that tyme be in neare conjunction" (*Johns Hopkins University Circular*, May). He finds that the date of observation in our present reckoning was August 16, 1664, and on that date the star B.A.C. 6448 (R.A. 18h. 46m. 55·6s. Decl. – 23° 21′ 33″·04) was at a distance from Jupiter of about 10′·5, which is approximately the distance that the outer satellite may reach. In brightness the star is about the same as the three smaller satellites—between the sixth and seventh magnitudes. Mr. Clutz thinks, therefore, that this star was the object which Winthrop took for a fifth satellite.

ANNIVERSARY MEETING OF THE ROYAL GEOGRAPHICAL SOCIETY.

THE report of the Council of the Royal Geographical Society was presented at the annual meeting on May 28. The total number of Fellows at May 1 was 3775, a net increase of 29 during the year.

The President and Council for the ensuing year were ballotted for and elected. The principal changes are the retirement of the honorary secretary, Mr. D. W. Freshfield, and the retirement from the Council by rotation of Mr. Francis Galton, Generals Sir W. D. Jervois, J. T. Walker, and Sir Charles Wilson, and Mr. Delmar Morgan. Mr. Clements R. Markham was re-elected as President, the Hon. G. N. Curzon was added to the list of Vice-Presidents, Sir John Kirk was elected Foreign Secretary, and Major Leonard Darwin to co-operate with Mr. H. Seebohm as Secretary. The following new Councillors were elected:—Dr. Robert Brown, Right Hon. Hugh Childers, General Goodenough, Lord Lamington, Admiral A. H. Markham, Admiral E. H. Seymour, and Colonel J. K. Trotter.

The Society's medals were presented in the absence of their recipients, Captain Bower and M. Reclus; the minor awards, already announced in NATURE, were also given, and a series of educational prizes to students from the training colleges.

The President then delivered his annual address, reverting from the recent custom of dealing with the progress of geography during the year to the earlier practice of devoting special attention to some prominent features of exploration.

The greater part of the address was devoted to the polar expeditions of the present year, the facts regarding which have already appeared in NATURE. Mr. Markham is a high authority on Arctic travel, and his views will carry much weight. He professes a strong preference for large expeditions organised by government, and commanded by naval officers, believing that men combining high scientific attainments, great experience of ice-navigation, and the rare qualities of a leader of men, all of which are necessary for a great polar

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explorer, are seldom to be found except in the service of a government with a wide range of selection. Still he would encourage all enterprise and every carefully planned expedition, on however small a scale. Without expressing any confidence in the correctness of Nansen's theories, he felt no doubt as to the great scientific results which must accompany his journey. With regard to Mr. Jackson's projected exploration in Franz-Josef Land, Mr. Markham did not favour Austria Sound as the best approach to Petermann Land, and he pointed out the drawback of the winter quarters of the expedition being so far south as Eira Harbour, between which and the point where really new ground can be broken, there intervenes a space of nearly 200 miles to be traversed each season; but with wise management and favourable conditions of ice and weather, a good measure of success appeared quite possible. In his scheme for retracing Parry's footsteps north of Spitzbergen, Mr. Wellman transgresses the best established canon of Arctic travel, which is never to enter the drifting pack away from land; but as he has started early, Mr. Wellman may possibly enough beat the record of the farthest north, a motive which was deprecated by the Austrian explorer, Weyprecht, as the bane of good Arctic work. Little service to geography is to be looked for from this expedition, unless there are islands north of Spitzbergen which may be explored. In speaking of Mr. Peary's journeys in the north of Greenland, Mr. Markham said: "For my own part, I look upon Peary as an ideal explorer. He chose one of the greatest and oldest of the geographical problems that remain to be solved, and he set to work as if he really intended to find the solution. Every detail of equipment was thoughtfully considered, gear was tried and tested before being used, a brilliant preliminary journey over the inland ice was made. All was done in the workmanlike style of a true discoverer. I therefore believe that Peary will succeed. I am sure that he deserves success." There is, in Mr. Markham's opinion, ground to hope that Björling and Kalstenius may be still alive; "the two Swedish lads are the stuff of which heroes are made, and every civilised people must be interested in their rescue." Want of funds has prevented a search expedition from being sent out, and the two Swedes who have left for Ellesmereland trust to be landed there by the good offices of whalers. No efforts on the part of the Council were spared to inaugurate a great Antarctic expedition, the promotion of which is now under consideration by the Royal Society.

In the evening the anniversary dinner of the Royal Geographical Society was held in the Whitehall rooms of the Hôtel Métropole.

THE MAGNETIC DEFLECTION OF CATHODE RAYS.

THE current number of the *Electrician* contains a translation of a very interesting paper by Herr P. Lenard, on the deflection of the cathode rays by a magnet. It is well known that when the cathode rays traverse a magnetic field they are deflected from their otherwise rectilineal path, and in the form of tube ordinarily employed this deflection increases with an increase in the pressure of the residual gas in the tube. In this particular the cathode rays behave just like a current of negatively charged particles projected from the cathode. The paths of such particles would be curved in a magnetic field, and the curvature would increase with a decrease in the speed with which the particles travel, *i.e.* they would be more curved in a denser and more resisting medium. The above explanation is not in accord with the results of the experiments the author has made, and which have led him to consider the cathode rays as phenomena in the ether. In fact, the author finds that when the observation tube and the tube in which the rays are generated, are separated by a gas-proof aluminium partition, so that the gaseous pressure can be varied in the two tubes independently, that the above explanation entirely fails, and that everything confirms his previous view that these rays are phenomena in the ether, and not electrically charged particles. For instance, if the pressure of the gas in the discharge-tube be kept constant, while that in the observing tube be lowered from 33 m.m. to 0·021 m.m. it is found that the deflection produced remains constant. Higher pressures than 33 m.m. could not be employed, as under these circumstances the medium became so turbid to these rays as to entirely destroy all definition in the phosphorescent spot. If, however, the pressure of the gas in the observing tube be kept constant, while that in the discharge tube is varied, a marked influence on the position of the deflected spot is at once observable. Thus, if the pressure is altered so that the sparking distance in the discharge tube changes from 2 cm. to 4 cm. there is an alteration in the deflection of from 12·2 m.m. to 8·5 m.m. Thus it would appear that the difference in the deflection observed with varying gas pressures in the ordinary form of tube is not caused by difference of the medium in which the deflection is observed, but in the difference of the rays themselves, which are produced with varying pressures of gas. A curious deformation in the shape of the deflected phosphorescent spot was observed, for while the undeflected spot was always circular in form, the distribution of light being dependent on the turbidity (*i.e.* density) of the gas in the tube, in very turbid gases the edge of the spot is undefined. If the gas becomes rarer there appears in the centre of the spot a more or less sharply defined kernel, surrounded by a less bright penumbra. After deflection the spots become elliptical in shape, which may be due to the fact that the rays no longer met the screen at right angles, but when the gas was so rarefied that there was a central bright spot and a penumbra, the appearance of the spot was subject to sudden changes. While the position and shape of the central spot remained constant, the penumbra changed both in shape and position, sometimes even being quite separate from the bright spot. The penumbra was in every case more deflected than the bright spot, thus showing that the penumbra contains rays of greater deflectibility than the core, but never of less. This is borne out by previous experiments, which had shown that it is the rays that are most easily diffused that are most deflected.

SOME LONDON POLYTECHNIC INSTITUTES.[1]

II.

ON account of a mistaken idea as to the true end of education, the object of technical instruction is often defeated. Many young operatives take up courses of study in order that they may become clerks in manufactories where technical knowledge is desirable. This notion causes the ranks of the mechanic class to lose many of their brightest men, while the supply of clerks increases. What has to be impressed upon the minds of students in trade classes is that the object of the instruction is to enable them to perform their duties in a more efficient manner, not to remove them from one sphere of life to another. This point was very well expressed by Sir Benjamin Baker at the beginning of this year, in presenting the prizes and certificates to students at the People's Palace. "It is necessary," he said, "for teachers and students alike to remember that a certain amount of scientific or theoretical knowledge in the future, still more than in the present, must be considered as an indispensable element of success in the great battle of life, but not as a thing having necessarily any more market value in itself than a knowledge of reading and writing, nor must the facilities in acquiring knowledge now enjoyed by students be carried to such an extent as to incapacitate them from acting in an emergency promptly and reliantly without help from books or professors, or the benefits of scientific and technical education would be too dearly bought, and the self-education system of our predecessors would turn out the better men."

The People's Palace owes its existence almost entirely to the Drapers' Company. In the year 1890 this company took the entire management of the educational work, which was carried on under the supervision of Mr. William Phillips Sawyer, the clerk to the Company. Two years later, on the Drapers' Company having offered an annual contribution of £7000 to the Palace, a new scheme was drawn up by the Charity Commissioners, which provided for an annual grant of £3500 from the City and Parochial Charities' Funds, in addition to the Drapers' Company's contribution, and a new body of Governors was formed, of which the Master of the Drapers' Company acts as chairman. This body, besides representatives of the Drapers' Company, consists of members appointed by the London University, the London County Council, the London School Board, the Trustees of the City and Parochial Charities' Funds, and the Lord President of the Council.

The educational work consists of (1) the day technical

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[1] Continued from p. 90.

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